<u>HW:</u> p. 547: 5, 7, 9

p. 548: 19, 20

Properties of Gas:

- Volume → how much space gas takes up

- Number of particles (N or n):

  N = total # of particles

  n = # moles

  $$n = \frac{N}{6.02E23}$$

  ↳ Avogadro's #

- Pressure → gas exerts pressure by particles bouncing off walls of container

- Temperature → average velocity of particles in the gas

Ideal Gas Law:

$$PV = NkT$$

↳ $k = 1.38E-23$ J/(particles K)

*Use T in Kelvins!

$$PV = nRT$$

↳ $R = 8.314 \frac{J}{(mol \cdot K)}$

$$\frac{P_i V_i}{T_i} = \frac{P_f V_f}{T_f}$$

A spray can containing a propellant gas at twice atmospheric pressure (202 kPa) and having a volume of 125 cm^3 is at 22 degrees C. It is then tossed into an open fire. When the temperature of the gas in the can reaches 195 degrees C, what is the pressure inside the can?

Assume no change in volume.

Neither R nor n change, either.

$$\frac{P_i \cancel{V_i}}{T_i} = \frac{P_f \cancel{V_f}}{T_f}$$

$$P_f = \frac{P_i T_f}{T_i}$$

*Use K for temperature!

$$= 320 \text{ kPa}$$

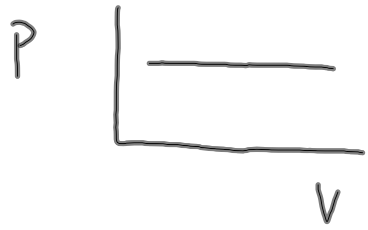
An automobile tire is inflated with air originally at 10 degrees C and normal atmospheric pressure. During the process, the air is compressed to 28% of its original volume and the temperature is increased to 40 degrees C.
a) What is the tire pressure?
b) After the car is driven at high speed, the tire's air temperature rises to 85 degrees C and the tire's interior volume increases by 2%. What is the new tire pressure (absolute) in pascals?

a) 400 kPa

b) 449 kPa

Gas Processes:

1. Isobaric → constant pressure

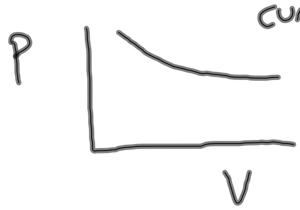


$$\frac{V_i}{T_i} = \frac{V_f}{T_f}$$

2. Isochoric → constant volume

$$\frac{P_i}{T_i} = \frac{P_f}{T_f}$$

3. Isothermal → constant temperature
curved function



$$P_i V_i = P_f V_f$$

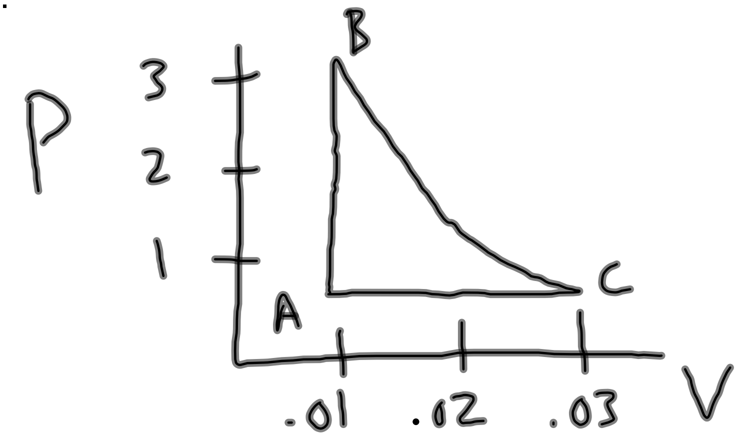
4. Adiabatic → no heat flow

steeper curve than isothermal

no simple algebraic equation

#1:

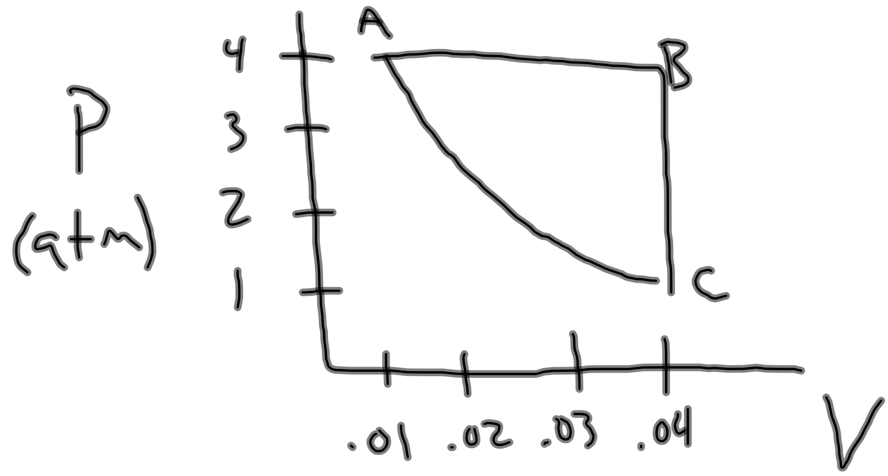
0.1 moles of an ideal gas is taken through the following steps:
1. The gas increases its pressure from 0.5 atmosphere at 0.01 m^3 to 3 atmospheres during an isochoric process.
2. The gas then undergoes an adiabatic expansion out to 0.029 m^3 where it is once again at the original pressure.
3. Finally, the gas has an isobaric contraction back to its original volume and pressure.



Point	(atm) Pressure	(m^3) Volume	(K) Temperature
A	.5	.01	601
B	3	.01	3610
C	.5	.029	1744

#2:

0.2 moles of an ideal gas is taken through the following cycle:
1. The gas starts at a pressure of 4 atmospheres and a volume of 0.01 m^3 and expands under an isobaric process until it reaches a volume of 0.04 m^3.
2. The gas then decreases pressure under an isochoric process until it is at a pressure of 1 atmosphere.
3. The gas then contracts isothermally until it is back to its original state.



Point	Pressure (atm)	Volume (m^3)	Temperature (K)
A	4	0.01	2405
B	4	0.04	9620
C	1	0.04	2405